# Spot Safety Project Evaluation

Project Log # 200703087

Spot Safety Project # 03-00-205

**Spot Safety Project Evaluation of the Installation of a Traffic Signal at the Intersection of NC 132 (College Rd) at Bragg Dr in Wilmington**
**New Hanover County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

**Principal Investigator**

_____ 6/16/2008
Brad Robinson, EI Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## Subject Location

Evaluation of Spot Safety Project Number 03-00-205 – The Intersection of NC 132 (College Rd) and Bragg Dr in New Hanover County.

## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal with metal strain poles. The subject location is a four-leg intersection which was controlled by stop signs on Bragg Dr in the before period. NC 132 (College Rd) is a four lane divided roadway with auxiliary left and right turn lanes on both approaches to the subject intersection. The speed limits are 45 mph for NC 132 and 25 mph for Bragg Dr.

The original statement of problem was that there was a pattern of Angle and Left Turn Crashes resulting from motorists being unable to safely enter NC 132 for Bragg Dr.

The initial crash analysis was conducted from November 1, 1996 to October 31, 1999 with a total of 28 crashes, nine of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 8, 2002 with a total cost of $50,000.00.

## Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 2001 to March 31, 2002. The before period consisted of reported crashes from April 1, 1996 through October 31, 2001 (5 years and 7 months) and the after period consisted of reported crashes from April 1, 2002 through October 31, 2007 (5 years and 7 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

| **Treatment Information** | | | |
|---|---|---|---|
| | **Before** | **After** | **Percent Reduction (-) Percent Increase (+)** |
| Total Crashes | 47 | 48 | 2.1 |
| Total Severity Index | 8.16 | 6.93 | -15.1 |
| | | | |
| Target Crashes | 30 | 28 | -6.7 |
| Target Crash Severity Index | 10.49 | 9.59 | -8.6 |
| | | | |
| Volume | 38,000 | 40,700 | 7.1 |
| | | | |
| **Crash Severity Summary** | | | |
| Fatal Crashes | 0 | 0 | N/A |
| Class A Crashes | 2 | 2 | 0.0 |
| Class B Crashes | 9 | 5 | -44.4 |
| Class C Crashes | 16 | 13 | -18.8 |
| PDO Crashes | 20 | 28 | 40.0 |

The naive before and after analysis at the treatment location resulted in a 2 percent increase in Total Crashes, a 7 percent decrease in Target Crashes, and a 7 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2005.

**Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 2 percent increase in Total Crashes and a 7 percent decrease in Target Crashes. The Total Severity Index decreased by 15 percent and the Target Crash Severity Index decreased by 9 percent. The summary results above demonstrate that although Total Crashes appear to have increased slightly at the treatment location, Target Crashes appear to have decreased from the before to the after period.

The calculated benefit to cost ratio for this project is 1.67 considering total crashes. The benefit to cost ratio considering only target crashes is 1.62. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs

Referencing the *Collision Diagrams*, Frontal Impact Crashes involving vehicles entering the intersection from Bragg Dr reduced by 73 percent (from 22 to 6). It appears that the signal installation was successful in reducing this type of crash pattern.

Although the signal installation reduced the Target Crashes that were prevalent in the before period, new Target Crash patterns emerged after the signal was installed. Left Turn-Same Roadway Crashes involving vehicles attempting to turn onto Bragg Dr from NC 132 increased by 150 percent (from 8 to 20). The signal has protected/permitted phasing for this movement, although at least 19

of the 20 crashes occurred during the permitted phase (one was undetermined). Fifteen of the 20 crashes involved northbound NC 132 vehicles turning left.

Rear-End Crashes involving vehicles on NC 132 approaching the intersection increased by 225 percent (from 4 to 13). An increase in Rear-End Crashes is somewhat expected with the installation of a signal.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 132 at Bragg Dr
COUNTY: New Hanover
FILE NO.: SS 03-00-205

BY: Brad Robinson
DATE: 2/22/2007

DETAILED COST: TYPE IMPROVEMENT - Signal

| ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST |
|---|---|---|---|---|
| Construction | $0 | 0 | 0.000 | $0 |
| | $50,000 | 10 | 0.149 | $7,451 |
| Right-of-Way | $0 | 0 | 0.000 | $0 |
| TOTALS | $50,000 | 10 | 0.149 | $7,451 |

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $10,751
TOTAL COST OF PROJECT= $50,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

| TIME PERIOD | YEARS | K & A CRASHES | K & A CRASHES PER YR | B & C CRASHES | B & C CRASHES PER YR | PDO CRASHES | PDO CRASHES PER YR | ANNUAL COSTS |
|---|---|---|---|---|---|---|---|---|
| BEFORE | 5.59 | 2 | 0.36 | 25 | 4.47 | 20 | 3.58 | $289,267 |
| AFTER | 5.59 | 2 | 0.36 | 18 | 3.22 | 28 | 5.01 | $271,342 |

Annual Benefits from Crash Cost Savings $17,925

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $7,173

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.67

TOTAL COST OF PROJECT - $50,000 COMPREHENSIVE B/C RATIO - 1.67

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|---|---|---|---|---|---|---|---|---|
| BEFORE | 5.59 | 2 | 0.36 | 18 | 3.22 | 10 | 1.79 | $258,140 |
| AFTER | 5.59 | 2 | 0.36 | 12 | 2.15 | 14 | 2.50 | $240,680 |

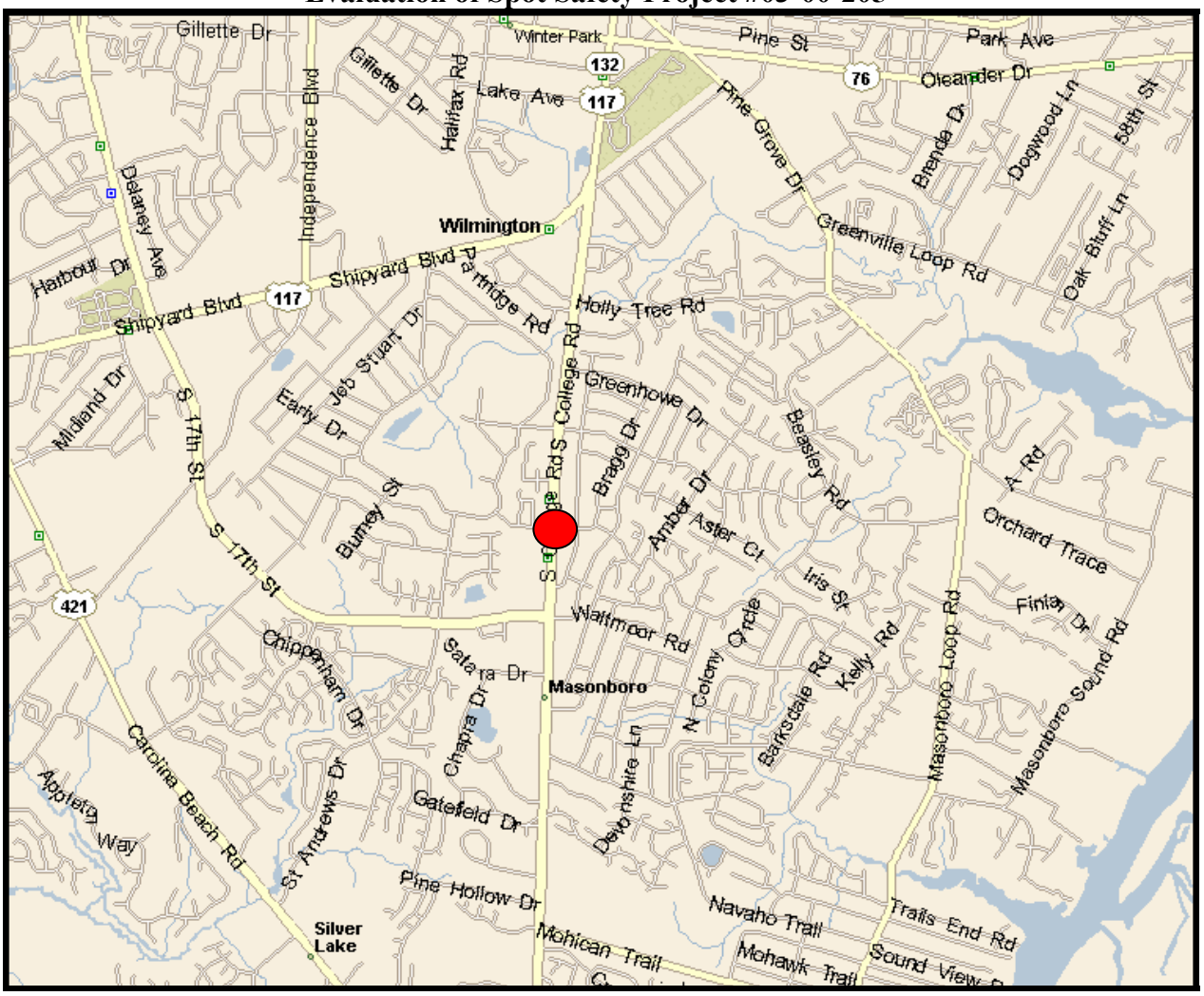
Annual Benefits from Crash Cost Savings $17,460

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $6,708

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.62

TOTAL COST OF PROJECT - $50,000 COMPREHENSIVE B/C RATIO - 1.62

**Location Map**
**New Hanover County**
**Evaluation of Spot Safety Project #03-00-205**




Treatment Location: NC 132 (College Rd) at Bragg Dr

**Treatment Site Photos Taken May 14, 2008**

Driving Northbound on NC 132 (College Rd)

Driving Southbound on NC 132 (College Rd)

Driving Eastbound on Bragg Dr

Driving Eastbound on Bragg Dr

# New Hanover County
# NC 132 (College) and Bragg Dr
# Before Period
# From 4/1/1996-10/31/2001

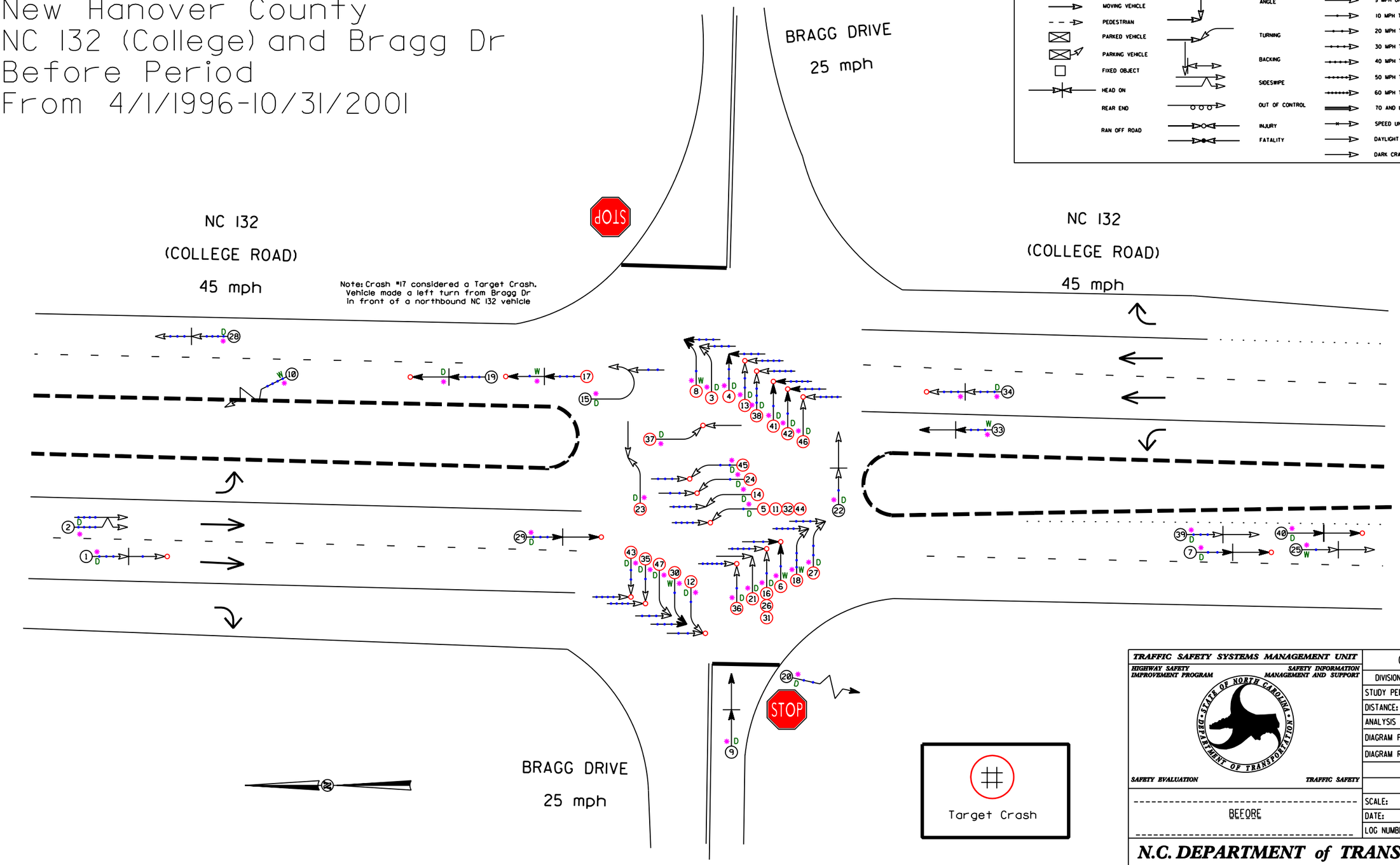
## LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN
DAYLIGHT CRASH
DARK CRASH

P PEDESTRIAN
B BICYCLE
T TRAIN
A ANIMAL
• DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY




TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY IMPROVEMENT PROGRAM — SAFETY INFORMATION MANAGEMENT AND SUPPORT

SAFETY EVALUATION — TRAFFIC SAFETY

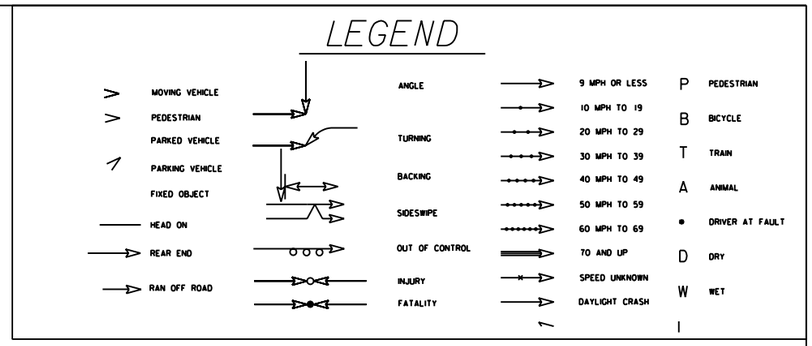
BEFORE

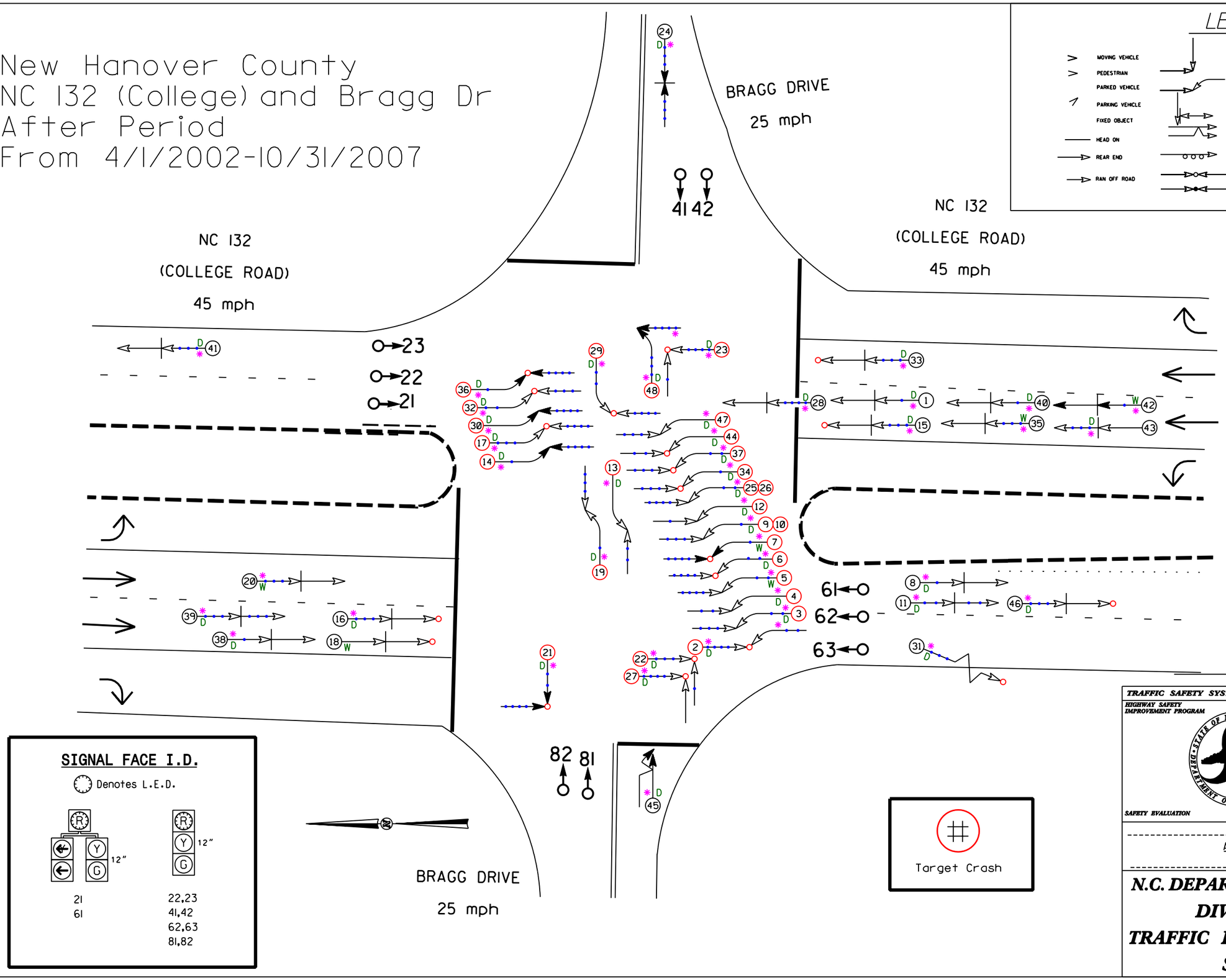
COLLISION DIAGRAM

| | |
|---|---|
| DIVISION: 3 | AREA: .. |
| STUDY PERIOD: 4/1/1996 TO 10/31/20012 | |
| DISTANCE: ..... | Y-LINE: 150 FT |
| ANALYSIS PREPARED BY: B.Robinson | |
| DIAGRAM PREPARED BY: B.Robinson | |
| DIAGRAM REVIEWED BY: ---------- | |
| SCALE: | NOT TO SCALE |
| DATE: | April 2008 |
| LOG NUMBER: | 20070308? |

**N.C. DEPARTMENT of TRANSPORTATION**
**DIVISION of HIGHWAYS**
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**

# New Hanover County
# NC 132 (College) and Bragg Dr
# After Period
# From 4/1/2002-10/31/2007




## SIGNAL FACE I.D.

Denotes L.E.D.

12"

21
61

22,23
41,42
62,63
81,82

| TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT | COLLISION DIAGRAM |
|---|---|
| HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT | DIVISION: 3 AREA: .. |
| | STUDY PERIOD: 4/1/2002 TO 10/31/2007 |
| | DISTANCE: ..... Y-LINE: 150 FT |
| | ANALYSIS PREPARED BY: B.Robinson |
| | DIAGRAM PREPARED BY: B.Robinson |
| | DIAGRAM REVIEWED BY: ---------- |
| SAFETY EVALUATION / TRAFFIC SAFETY | |
| AFTER | SCALE: NOT TO SCALE |
| | DATE: April 2008 |
| | LOG NUMBER: 20070308? |

**N.C. DEPARTMENT of TRANSPORTATION**
**DIVISION of HIGHWAYS**
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**